UNIVERSAL GPS TRAFFIC MONITORING SYSTEM

This utility patent is based on can claims the filing date of U.S. Provisional Patent Application, filed on Oct. 10, 2008, (Ser. No. 61/104,694) and U.S. Provisional Patent Application filed on Apr. 4, 2009 (Ser. No. 61/166,716).

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present disclosure relates to monitoring traffic data, and more particularly to aggregating traffic data from Global Positioning System ("GPS") enabled mobile devices.

2. Description of the Related Art

Currently, traffic-monitoring systems act more as blunt instruments, than as precision tools. For example, what appears to be gridlock on a traffic monitoring system may have completely vanished by the time a driver arrives; other times, a driver may head straight into a traffic jam without receiving any alert.

In some cases, such shortcomings may arise at least in part because there may not be a single source of reliable live traffic information. Therefore, current traffic monitoring services often have to collect their own traffic data from a range of sources of varying accuracy. Sources of traffic data may include construction alerts from municipalities, incident reports from police departments about events like accidents and parades, and traffic volume data from governmental transportation agencies. For example, a state Department of Transportation ("DOT") may use periodic updates from traffic cameras and loop sensors embedded in roads to judge how traffic is moving.

However, each of these sources of traffic information may have inherent limitations. For example, construction alerts are often out of date, and incident reports are often delayed. Moreover, data from loop sensors may take time to calculate, and more sophisticated sensors cover only a fraction of the nation's roads.

In some cases, DOT may make traffic data available to public. However, DOT-provided traffic data is often delayed by up to thirty or more minutes. Accordingly, DOT-provided data often does not provide up-to-the-second, truly local traffic information. Some private companies may also collect traffic data, often using roadside radar sensors with cellular radios to transmit real-time speed information to regional offices.

Traffic data from sources such as those described above may not provide accurate and detailed information about traffic from mile to mile. For example, many traffic monitoring systems may only provide a gross level of detail. For example, many current systems may display traffic data with a few different colors to show traffic status (e.g., green, yellow, red, and black). In addition, the length of a traffic-report roadway segment may be miles long, with only a single "color" applied to the entire segment. In many cases, current traffic monitoring systems may not provide enough detail to allow drivers to accurately determine alternative routes around a traffic obstruction.

In some cases, current traffic information systems may use data from one or more GPS-enabled mobile devices. However, current systems may require mobile devices to download "virtual trip line" data. "Virtual trip lines" ("VTL") are geographical markers that define certain geographic locations, such that whenever a participating device passes through the trip line, information is relayed to the traffic information collection servers. Thus, a GPS-enabled mobile device is generally required to download and cache VTL data. Furthermore, a mobile device must frequently determine whether it has traversed a VTL, so that it knows whether to send measurements to a traffic information collection server. To determine trip line traversals, a mobile device must check if the line between the current GPS position and a previous GPS position intersects with any of the VTL in its cache. This calculation generally imposes significant computational overhead and may decrease battery life, often significantly. In addition, virtual trip line systems by their very nature may have difficulty providing detailed traffic information about relatively short road segments (as they only collect data when a mobile device passes a virtual trip line).

In sum, many current traffic monitoring systems have some or all of the following limitations:

Traffic sensors are fixed in place;

Expensive;

Time delayed;

Limited to primary roads (e.g., primarily main highways, with little or no coverage for secondary and tertiary roads); and,

Provide only a gross level of detail;

SUMMARY OF THE INVENTION

A traffic data collection process and monitoring system that uses a plurality of GPS enabled mobile devices to intermittently or continuously transmit near at real-time traffic speed, direction and location information to a server. The sever processes and transforms the information from a plurality of mobile devices and the saves it in a database containing a plurality of pre-designated traffic monitoring points in the region. The speeds from a plurality of mobile devices for a particular traffic monitoring point (called TMPs) are transformed and averaged. Because the processing is done on the server, the computational load and power consumption of the mobile devices is reduced.

The system includes a server with a Traffic Pattern Recognition software program (called TPR) loaded into its working memory. In addition to collecting the speed and location data from the mobile devices, the TPR also further transforms the data to sort out valid traffic data from invalid traffic data. When the speed/location data is sent from the mobile devices to the server, the TPR builds a Distributed Traffic Data Store database containing the average speeds for designated TMPs created for the region. The time intervals for sending the speed/location data from the mobile device to the server is determined by either the mobile device (a default setting) or by the server. During use, the time interval for sending the speed location data may be adjusted.

During use, traffic information is continuously or intermittently download from the sever to the mobile device. The request contains the boundary data information and the zoom level information. The information is then further processed and used to instruct the server which Distribution Traffic Data Store database should be used and which TMPs average speeds should be transmitted. The zoom level information instructs the server on how many TMPs average speeds are collected. When more than one traffic data is sent from mobile devices for the same TMP location, the server then calculates the average speeds using the traffic data for the TMP and transmits it in a compressed format to the mobile device.

Some features of the system include: (1) the location of the TMP database on the server that contains a plurality of predetermined TMPS in the region where traffic is to be monitored; (2) during use, the speed and location data from each mobile device is uploaded to the server which then associates